What is claimed is:

A method for calculating position and time of a GPS receiver comprising:

providing pseudoranges that estimate the range of the GPS receiver to a plurality of GPS satellites;

providing an estimate of an absolute time of reception of a plurality of satellite signals;

providing an estimate of a position of the GPS receiver;

providing satellite ephemeris data;

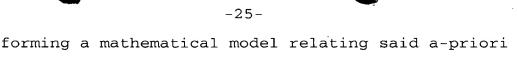
computing absolute position and absolute time using 1 said pseudoranges by updating said estimate of an absolute time and the estimate of position of the GPS receiver.

The method of claim 1 wherein said pseudoreanges are sub-millisecond pseudoranges.

3. The method of claim 1, wherein a first instance of said estimate of absolute time is in error by more than 10 milliseconds.

- 25 4. The method of claim 1, wherein said estimate of absolute time is provided by a clock that is not linked to a GPS reference time.
- The method of claim 1, wherein said estimates of 30 position and absolute time may be arbitrary guesses.
  - 6. The method of claim 1, further comprising: forming a-priori pseudorange-residuals; and

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pseudorange-residuals to said updates of said position and absolute time estimates; and

computing updates of the position and absolute time that fit the mathematical model.

- 7. The method of claim 6, wherein said a-priori rangeresiduals are a difference between expected ranges, from said satellites to said a-priori position estimate, and the 10 pseudoranges.
  - 8. The method of claim 6, wherein said expected ranges are computed at a time given by said a priori time estimate.
- 15 9. The method of claim 6, wherein said mathematical model is a linearization of a Taylor series of a non-linear mathematical model.
- 10. The method of claim 9, wherein said linearization is of 20 the form:

$$u_i = [\partial \rho_i / \partial x, \partial \rho_i / \partial y, \partial \rho_i / \partial z, \partial \rho_i / \partial t_C, \partial \rho_i / \partial t_S] * [x, y, z, t_C, t_S]$$

where:

- 25  $u_i$  is the a-priori range-residual, for one satellite;
  - $\rho_i$  is the pseudorange for a satellite i;
  - x, y and z are three coordinates of position updates;
  - $t_c$  is a common mode error update;
  - $t_s$  is an absolute time of reception update; and
- 30  $\theta$  denotes the partial derivative.
  - 11. The method of claim 4, wherein one or more of the updates is assumed known, so that the remaining updates may be computed.

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- 12. The method of claim 10, wherein one or more of the updates x, y, z, or  $t_c$  is assumed known, and set equal to an assumed value in the mathematical model, so that the remaining updates may be computed.
- 13. The method of claim 10, wherein one or more of the updates x, y, z, or  $t_c$  is assumed known, and added to the model as a pseudo-measurement so that the remaining updates may be computed.
  - 14. A process as in claim 6, wherein other measurements or constraints are used in the mathematical model.
- 15. A process as in claim 6, wherein said a-priori
  15 position is obtained from a location of a radio tower used to communicate with a mobile device containing said GPS receiver.
- 16. A process as in claim 6, wherein said absolute time 20 estimate is obtained from a real time clock in a server, said server being located remotely from said GPS receiver.
  - 17. A method for calculating absolute time of a GPS receiver comprising:

providing pseudoranges that estimate the range of the GPS receiver to a plurality of GPS satellites;

providing an estimate of position of the GPS receiver; and

computing absolute time using the pseudoranges and the position estimate.

18. The method of claim 1 wherein said pseudoranges are sub-millisecond pseudoranges.

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19. The method of claim 17, further comprising: forming a-priori pseudorange-residuals; and forming a mathematical model relating said a-priori 5 pseudorange-residuals to updates of said estimate of position and absolute time; and

computing updates of the position and absolute time that fit the mathematical model.

- 10 20. The method of claim 19, wherein said a-priori rangeresiduals are a difference between expected ranges, from said satellites to said a-priori position estimate, and the pseudoranges.
- 15 21. The method of claim 19, wherein said expected ranges are computed at a time given by said a priori time estimate.
- 22. The method of claim 19, wherein said mathematical model 20 is a linearization of a Taylor series of a non-linear mathematical model.
  - 23. The method of claim 22, wherein said linearization is of the form:

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 $u_i = [\partial \rho_i / \partial x, \partial \rho_i / \partial y, \partial \rho_i / \partial z, \partial \rho_i / \partial t_C, \partial \rho_i / \partial t_S] * [x, y, z, t_C, t_S]$ 

where:

 $u_i$  is the a-priori range-residual, for one satellite;

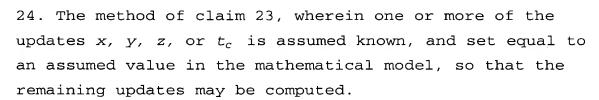
30  $\rho_i$  is the pseudorange for a satellite i;

x, y and z are three coordinates of position updates;

 $t_c$  is a common mode error update;

 $t_{s}$  is an absolute time of reception update; and  $\partial$  denotes the partial derivative.

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25. The method of claim 24, wherein one or more of the updates x, y, z, or  $t_c$  is assumed known, and added to the model as a pseudo-measurement so that the remaining updates may be computed.

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- 26. A process as in claim 24, wherein other measurements or constraints are used in the mathematical model.
- 27. A process as in claim 24, wherein said a-priori15 position is obtained from a location of a radio tower used to communicate with a mobile device containing said GPS receiver.
- 28. A method of calculating a GPS position for a GPS
  20 receiver from partial pseudoranges that have ambiguity in a
  number of integer milliseconds, comprising:
  - a) choosing an a-priori position of the GPS receiver;
  - b) calculating integers conforming to said a-priori position;
    - c) calculating a navigation solution;
    - d) calculating a-posteriori residuals; and
  - e) using a relative size of said a-posteriori residuals to determine if said calculated integers are correct; and
  - f) repeating steps c), d) and e) using another apriori position until residuals having a magnitude below a predefined threshold are computed.

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- A method as in claim 28, wherein said a-priori position is not within a specified distance of the actual receiver position.
- 5 30. A method as in claim 28, wherein said a-priori position is greater than 100km from the actual receiver position.
- A method as in claim 28, wherein said a-priori 10 position is greater than one integer millisecond from the actual receiver position.
  - 32. A method as in claim 28, wherein said a-priori position is an arbitrary guess.
  - system for computing position and time for a GPS receiven comprising:
  - a mobile device comprising a GPS receiver and a wireless transceiver;

a server being in wireless communication with said mobile device; where said GPS keceiver computes pseudoranges that estimate the range of the GPS receiver to a plurality of GPS satellites and the wireless transceiver transmits said 25 pseudoranges to the server;

where the server computes an absolute position and absolute time for the G 
abla S receiver using the pseudoranges and an estimate of position and time.

- The system of claim 33 wherein said pseudoranges are sub-millisecond pseudoranges.
- The system of claim 33 wherein the position estimate 35. is a position of a radio tower coupled to the server that 35 receives signals from the wireless transceiver.

